W. E. Ricker Shrimp Survey 87-S-1 to the West Coast of Vancouver Island, August 4-14, 1987

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by

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ABSTRACT

Boutillier, J. A. and W. R. Harling. 1987. W. E. Ricker Shrimp Survey 87-S-1 to the west coast of Vancouver Island, August 4-14, 1987. Can. Data Rep. Fish. Aquat. Sci. 675: 38 p.

This report summarizes trawl catch data collected off the west coast Vancouver Island during a shrimp biomass survey in August, 1987. The survey collected information on biomass and distribution of pink shrimp (Pandalus jordani). Detailed catch records and resulting evaluations of biomass are presented. Environmental data was also collected and is presented in a comparative fashion with previous survey data.

RÉSUMÉ

Boutillier, J. A. and W. R. Harling. 1987. W. E. Ricker Shrimp Survey 87-S-1 to the west coast of Vancouver Island, August 4-14, 1987. Can. Data Rep. Fish. Aquat. Sci. 675: 38 p.

Le présent rapport est un résumé des données sur les prises au chalut recueillies au large de la côte ouest de l'île de Vancouver au cours d'un levé de la biomasse de crevettes effectué en août 1987. Ce levé visait la collecte de données sur la biomasse et la répartition de la crevette nordique (Pandalus jordani). On présente des données détaillées sur les prises et les évaluations de la biomasse. On a aussi recueilli des données environnementales qui sont comparées à des données recueillies au cours de levés antérieurs.

INTRODUCTION

This document summarizes trawl catch data collected off the west coast Vancouver Island during a shrimp biomass survey in August, 1987. The primary objective of this survey was to obtain population estimates of smooth pink shrimp (Pandalus jordani) on the Tofino and Nootka grounds. As with previous surveys of these grounds (1977-1983, and 1985), the assessment was conducted using and 18.6 m Nat. Mar. Fish. Ser., high-rising, shrimp-sampling trawl and shrimp stock size was estimated using a standard area-swept procedure (Boutillier et al. 1977).

Trawl locations for the biomass survey of Tofino and Nootka shrimp grounds were established using a systematic grid pattern based on Loran C blocks. Tows were made diagonally through adjacent 5900-Z 10-microsecond blocks along successive 5900-Y lines 20 microseconds apart. Variations in the grid patterns occurred when exploring new areas, avoiding bad bottom, or being set off by strong tide and wind.

Sampling Procedure

Tow duration was, with the exception of one snag tow, 30 minutes and distance covered, depending on tide and wind, ranged from 1.0 to 1.8 nautical miles (M) with an average distance of 1.5 M (Table 1). From each trawl catch dumped on deck, large species were sorted, weighed and discarded. A small bucket of shrimp was then "scooped" from the approximate center of the remaining pile for analysis. From this bucket, a one kilogram sample of smooth pink shrimp was weighed, counted to determine the number of shrimp/kilogram (No./kg), sorted by sex, and measured (orbit of the eye to mid-dorsal, posterior margin of the carapace).

The balance of each catch, consisting of shrimp, small fish, and invertebrates, was shoveled into baskets and weighed. One tub, arbitrarily deemed to be representative, was then sorted by species and each species re-weighed. Percentage of shrimp by weight was calculated and total shrimp weight in the catch extrapolated; as were the weights of remaining species encountered in the representative basket.

RESULTS

In total, 68 sequentially numbered trawl hauls were completed: 55 on Tofino ground (Fig. 1) and 13 on Nootka ground (Fig. 2). Water temperature profiles were collected with an expendable bathythermograph at 3 of the trawl locations. Detailed bridge logs, catch records and surface/bottom temperature observations are listed in Appendix table 1.

Total catch, by dominant species, from the two grounds is listed in Table 2.

Tofino Ground

The Tofino shrimp ground lies offshore from the west coast of Vancouver Island between 48°40' and 49°15' north latitude. This area-swept biomass survey found that shrimp were concentrated in a 183 nautical square mile (M^2) area extending 35 M in a NE direction from 48°41' to 49°11' N latitude between 126°06' and 126°38' W longitude.

Of the 55 tows made on Tofino ground, 39 contained some shrimp and 36 were used to determine the area of shrimp concentrations. Catch rates ranged from trace amounts to 703 kg per nautical mile towed (kg/M) with a mean catch rate of 134 kg/M. An unweighted estimate of the age-class structure of the shrimp determined that the samples were composed of 22% 1-year-old, 56% 2-year-old, and 22% 3-year-old animals. Mean carapace size for these three age groups were 16.0, 20.1, and 22.8 mm, respectively. The number of shrimp per kilogram ranged from 136 to 282 while the size and density of shrimp for each tow combined to give an overall weighted mean of 208.

A preliminary estimate of the total shrimp biomass for the area was 4270 metric tonnes (t); the greatest quantity observed since 1977 (Table 3). The first indication of this increase in stock size was documented in the results of the research biomass survey completed in May 1985 (Boutillier and Harling 1985).

Nootka Ground

Nootka ground lies offshore from the west coast of Vancouver Island between 49°15' and 49°35' N latitude. During this survey, insufficient time precluded a thorough assessment of the area. As a result, only 13 tows were completed. Of these, 12 contained some shrimp and the area of concentration was estimated to be 76 M^2 extending 17 M in a NE direction from 48°15' to 49°32' N latitude between 126°50' and 127°08' W longitude.

Catch rates ranged from trace amounts to 337 kg/M with a mean catch rate of 57 kg/M. An unweighted estimate of the age-class structure of the shrimp found that the samples were composed of 23% 1-year-old, 55% 2-year-old, and 22% 3-year-old shrimp. Mean carapace size for these three age groups were 15.3, 19.0, and 21.1 mm, respectively. The number of shrimp per kilogram ranged from 188 to 257 while the size and density of shrimp for each tow combined to give an overall weighted mean of 222.

Total shrimp biomass for the area was estimated to be 754 t; a slight increase over the 1985 and 1983 estimates (Table 3).

A comparison of the two grounds showed that the size of shrimp on the Nootka ground are consistently smaller than the shrimp on the Tofino ground. Incidental catch of other invertebrate species, especially brittle stars, jellyfish, and fish was much greater on Nootka ground and made sorting of the catch more labour intensive.

Water Temperature

The few XBT's taken indicated that bottom temperatures were similar to those encountered during May, 1985 (Table 4). However, because of the different time periods, observations may not be directly comparable.

Miscellaneous Collections

1. During the survey, a representive from the National Museum of Canada examined various fish and invertebrate species for parasitic isopods.

2. Tissue samples of lingcod (Ophioden elongatus) were collected for electrophoretic analysis at the Pacific Biological Station as an aid to species identification by Fisheries and Oceans enforcement personnel.

Personnel

Name	Agency
J. A. Boutillier	Pacific Biological Station
W. R. Harling	Pacific Biological Station
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REFERENCES

Boutillier, J. A., A. N. Yates, and T. H. Butler. G. B. REED Shrimp Cruise 77-5-1. May 3-14, 1977. Fish & Mar. Ser. Data Rep. 37: 42 p.

Boutillier, J. A. and W. R. Harling. G. B. REED Shrimp Cruise 85-S-1. May 24-June 7, 1985. West coast of Vancouver Island and Queen Charlotte Sound. Can. Data Rep. Fish. Aquat. Sci. 563: 54 p.

Table 1. Shrimp (P. jordani) catch, distance travelled, catch per nautical mile and number per kilogram, for Tofino and Nootka grounds during the August, 1987 biomass survey off west coast Vancouver Island.

Tow No.	Catch (kg)	Distance (M)	Catch/M (kg)	No./kg
		Tofino Ground		
1	240	1.24	194	223
2	0	1.35	-	-
3	0	1.40	-	-
4	0	1.65	-	-
5	0	1.40	-	-
6	T	1.68	T	-
7	914	1.30	703	206
8	3	1.30	2	-
9	0	1.40	-	-
10	130	1.45	90	270
11	37	1.35	27	136
12	0	1.57	-	-
13	174	1.65	105	205
14	269	1.35	199	220
15	57	1.60	36	155
16	0	1.50	-	-
17	0	1.60	-	-
18	103	1.00	103	178
19	636	1.49	427	193
20	73	1.65	44	223
21	129	1.40	92	252
22	414	1.60	259	282
23	354	1.50	236	193
24	357	1.50	238	202
25	243	1.60	152	173
26[a]	0	0.40	**[a]	-
27	13	1.28	10	137
28	555	1.47	378	189
29	316	1.50	211	203
30	221	1.40	159	161
31	65	1.60	41	239
32	121	1.40	86	211
33	323	1.40	231	201
34	T	1.41	T	-
35	9	1.50	6	166
36	99	1.55	64	190
37	38	1.37	28	206

Table 1 (cont'd)

Tow No.	Catch (kg)	Distance (M)	Catch/M (kg)	No./kg
		Tofino Ground		
38	46	1.70	27	236
39	151	1.50	101	200
40	5	1.70	3	166
41	0	1.75	-	-
42	349	1.45	241	212
43	0	1.80	-	-
44	260	1.50	144	202
45	0	1.30	-	-
46	607	1.60	379	210
47	0	1.70	-	-
48	0	1.40	-	-
49	T	1.70	T	-
63	3	1.50	2	-
64	108	1.55	70	221
65	123	1.60	77	256
66	0	1.50	-	-
67	80	1.37	58	265
68	0	1.40	-	-
		Nootka Ground		
50	42	1.60	26	229
51	30	1.69	18	213
52	506	1.50	337	210
53	6	1.40	4	230
54	156	1.63	96	257
55	27	1.42	19	188
56	43	1.50	29	230
57	45	1.40	32	254
58	T	1.60	T	-
59	15	1.60	9	228
60	4	1.70	2	225
61	T	1.70	T	-
62	0	1.40	-	-

[a]Snag tow. Data not used.

Table 2. Total catch, by dominant species, for the west coast Vancouver Island shrimp biomass survey, August 4-14, 1987.

Species	Catch (kg)	% of total
Tofino Ground		
Smooth pink shrimp (Pandalus jordani)	7562	53.3
Eulachon (Thaleichthys pacificus)	2020	14.2
Turbot (Atherestes stomias)	1931	13.6
Dogfish (Squalus acanthias)	442	3.1
Dover sole (Microstomus pacificus)	302	2.1
Hake (Merluccius productus)	267	1.9
Lingcod (Ophiodon elongatus)	261	1.8
Yellowtail rockfish (Sebastes flavidus)	169	1.2
Slender sole (Lyopsetta exilis)	151	1.1
Sablefish (Anaplopoma fimbria)	143	1.0
Other (species or groups amounting to less than 1% of total catch--see footnotes to Appendix table 1).	935	6.6
Totals	14,183	99.9
Nootka Ground		
Smooth pink shrimp	877	39.3
Turbot	470	21.1
Eulachon	337	15.1
Yellowtail rockfish	175	7.8
Canary rockfish (S. pinniger)	53	2.4
Other (species or groups amounting to less than 2% of total catch--see footnotes to Appendix table 1).	319	14.3
Totals	2,231	100.0

Table 3. Estimated biomass (tonnes) and distribution (km^2) of smooth pink shrimp (P. jordani) off the west coast Vancouver Island, 1977-1987.

	Tofino Ground		Nootka Ground	
Year	Biomass (t)	Area (km^2)	Biomass (t)	Area (km^2)
1987	4270	628	754	257
1985	1782	648	566	329
1983	30	3	604	298
1982	813	165	171	89
1981	1528	336	1449	202
1980	479	163	418	137
1979	1162	247	935	192
1978	1743	254	804	151
1977	4627	748	2359	329
1976	9716	720	3302	175
1975	7176	659	1651	165
1973	9716	556	1016	89

Table 4. Mean bottom temperatures (°C) observed during shrimp surveys of the west coast of Vancouver Island and Queen Charlotte Sound, 1977-87. (Number of observations in parentheses.)

Depth (m)	1987	1985	1983	1982	1981	1980	1979	1978	1977
				Tofino Ground					
55 - 90	7.1 (1)	7.4 (4)	-	8.3 (1)	8.1 (2)	-	-	-	-
91 -126	6.5 (1)	7.1 (9)	8.6 (6)	7.6 (11)	7.6 (12)	7.8 (13)	7.8 (8)	7.6 (12)	7.3 (9)
127-163	6.7 (1)	6.6 (5)	8.1 (7)	7.4 (7	7.1 (7)	7.4 (13)	7.4 (5)	6.8 (25)	6.9 (8)
164-199	-	-	7.9 (2)	6.8 (1)	6.5 (1)	-	-	6.9 (2)	-
				Nootka Ground					
91-1269	-	6.8 (3)	-	7.2 (4)	7.0 (2)	7.5 (4)	7.5 (2)	6.2 (1)	6.9 (1)
127-163	-	6.6 (1)	7.9 (6)	6.6 (3)	6.7 (6)	7.2 (8)	7.4 (2)	6.7 (3)	6.4 (2)
164-199	-	-	7.8 (1)	6.3 (1)	-	-	7.1 (1)	-	-
200-236	-	-	7.9 (2)	-	-	-	-	-	-
				Queen Charlotte Sound					
127-163	-	-	-	6.7 (2)	6.9 (1)	-	6.6 (1)		
164-199	-	6.0 (1)	6.7 (1)	6.4 (3)	6.6 (2)	6.3 (2)	6.4 (3)		
200-236	-	5.9 (2)	6.7 (1)	6.4 (4)	6.2 (1)	6.1 (4)	6.3 (1)		

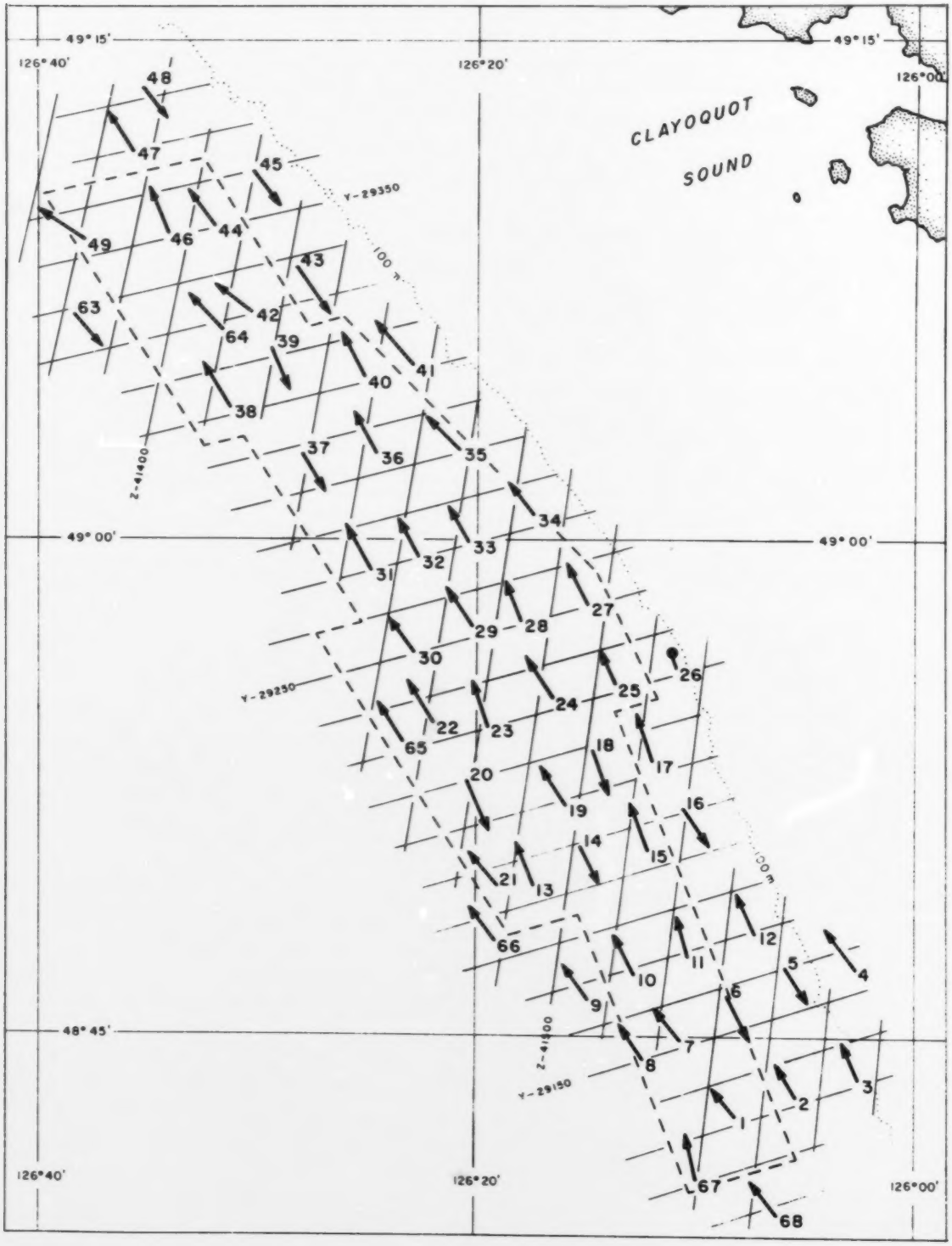

Fig. 1. Location of Tofino ground trawl hauls and boundary of shrimp concentration (dashed line), August, 1987.

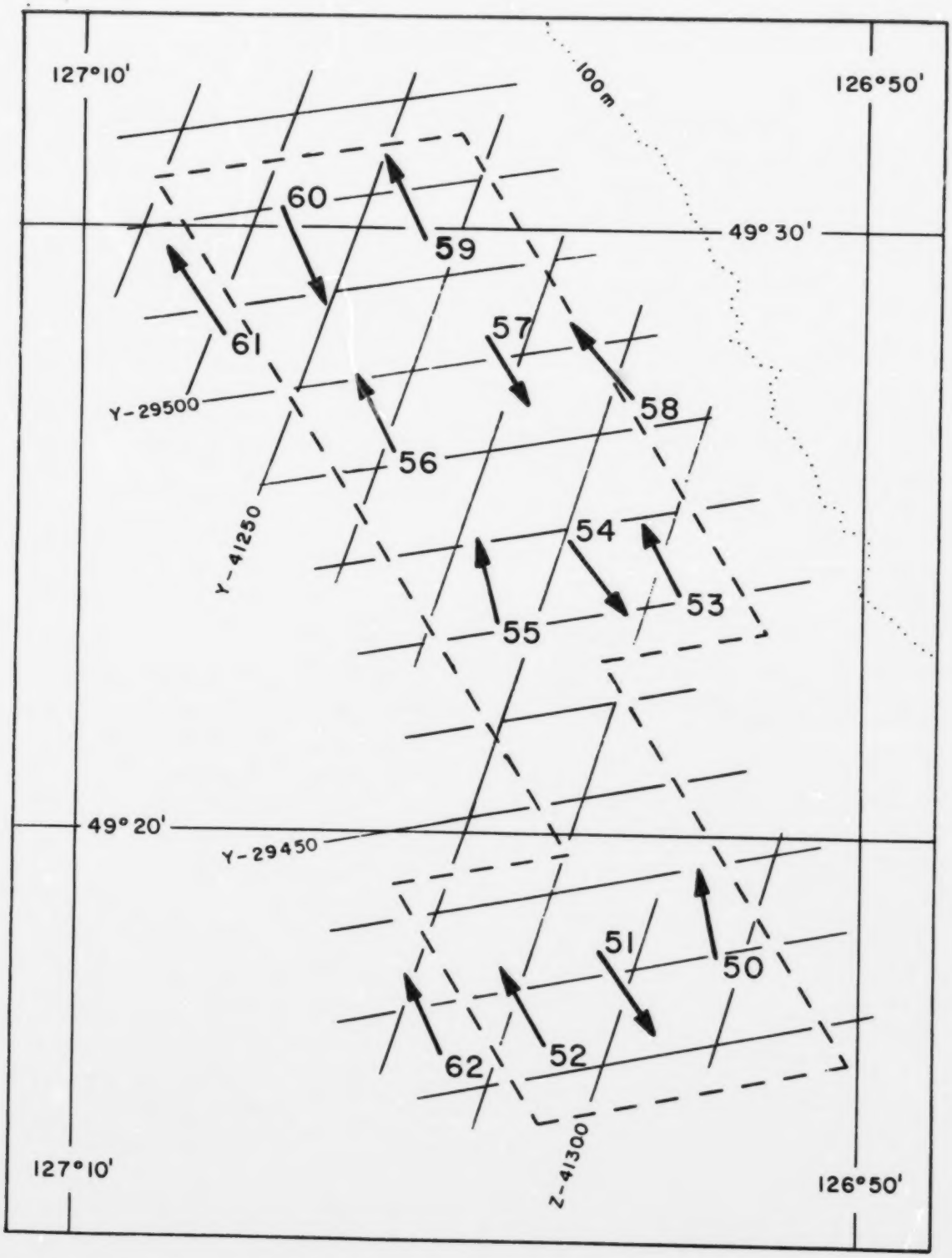

Fig. 2. Location of Nootka ground trawl hauls and boundary of shrimp concentration (dashed line), August, 1987.

Appendix table 1 pages 13 through 38 do not appear in paper, but appear in microfiche form at the back of this report.